Clinical Features of 16 Cases of Headache Which Were Provoked after Watching 3-D Videos

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Abstract

Objective Although a lot of people have recently reported headaches provoked after watching 3-D videos, the clinical features of the so-called “3-D headache” have not been clarified. In this study, we investigated the clinical features of headaches provoked after watching 3-D videos.

Methods We conducted a questionnaire survey by email to cases who described headaches caused by watching 3-D videos on a Weblog. We established the diagnostic criteria for 3-D headaches, which are as follows for a definite 3-D headache: A) Provoked after watching 3-D videos, but was never provoked by 2-D videos, B) Never experienced previously, C) Unclassifiable by the ICHD-II. A possible 3-D headache was one that met the criteria of A) and B) the same as above, C) Classified as a “probable” subform by the International Classification of Headache Disorders-2nd Edition (ICHD-II).

Results We received answers from 16 cases (5 males, 11 females, average age of 35.8 years old). Eleven of the 16 cases had experienced an entirely new type of headache after watching 3-D videos. Of these 11 cases, 5 were diagnosed as having a definite “3-D headache”. The other 6 cases were diagnosed as having possible 3-D headaches. The remaining 5 of 16 cases were suspected to be attacks of primary headaches that the cases were accustomed to having experienced. The common characteristics of the 5 definite 3-D headaches were that they were bilateral and non-pulsating, and the duration was from 10 minutes to 24 hours. The intensity of the 3-D headache was as follows; severe in 2 cases, moderate in 2 cases, and mild is one case. Three of the 4 cases with moderate to severe headache had nausea.

Conclusion The headaches provoked after watching 3-D videos include not only the attacks of primary headaches but also the headache attacks unclassifiable by the ICHD-II.

Key words: headache, 3-D headache, 3D headache, 3-D, 3D, three dimensions

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Introduction

The use of 3-D in movies and TV has become popular in recent years. The latest generation of Hollywood 3-D movies were released beginning in 2009, and made a big hit, and the first 3-D TV was released in 2010. As a result, watching 3-D videos has become increasingly common. In the past, the potential health hazards caused by certain animated programs with regard to optic hyperesthesia-related seizures were recognized (1). At present, there is concern about the potential health hazards caused by the 3-D videos. The 3-D videogame maker, Nintendo, suggests that game players should pay attention to symptoms of physical discomfort (headaches, nausea, etc.) related to 3-D. They recommend that the audience should take a 15 minute break after every 30 minutes of 3-D game play. They recommend that the 3-D features should only be used by children ages 7 years and older (2).

There are currently numerous reports about headaches provoked after watching 3-D videos on the internet. Mizuho Information & Research Institute investigated 79 cases who watched active-shutter 3-D movies, and thereafter “headache and neck pain” were observed in 11.4% of the cases (3). As 3-D videos continue to become more popular, the development of headaches provoked after watching 3-D videos
Table 1. The Questionnaire

(1) Please tell me your age and sex.
(2) When did your headache occur?
(3) Did you wear 3-D glasses?
(4) How long did it take from when you started watching the movie or show (or playing the game) until the headache occurred? How long did it persist?
(5) Did you have convulsions, loss of consciousness, or an epileptic seizure?
(6) Did you have an aura consisting of at least one of the following (a. to c.)?
   a. Fully reversible visual symptoms, including positive features (e.g., flickering lights, spots or lines) and/or negative features (i.e., loss of vision).
   b. Fully reversible sensory symptoms, including positive features (i.e., pins and needles) and/or negative features (i.e., numbness)
   c. Fully reversible dysphasic speech disturbance
(7) Please tell me about the characteristics of the headache.
   a. Where was the headache located, was it unilateral or bilateral?
   b. Was your headache pulsating in quality or non-pulsating in quality?
   c. What was the pain intensity of the headache, mild, moderate, or severe?
   d. Was your headache aggravated by or did it cause you to avoid routine physical activity (e.g., walking or climbing stairs)?
(8) During the headache, did you have at least one of the following: nausea and/or vomiting, photophobia, phonophobia? If so, which one(s)?
(9) Have you often had headaches in the past? If so, did the headache you developed after watching 3-D images have the same characteristics as the past headaches?
(10) Have you experienced a similar headache after watching normal 2-D television and/or movies?
(11) Do you have a past history or comorbidity which is now under treatment?
(12) Do you have family history of headache? If so, who is affected?

should be regarded as an urgent investigational theme. However, the details about the clinical features of these “3-D headaches” have not been reported. The purpose of this study was to investigate the detailed clinical features of the headaches provoked after watching 3-D videos, such as movies, games, or television programs.

Materials and Methods

We sent emails to 92 cases who described headaches caused by 3-D videos on a Weblog from December 2010 to January 2011. The questionnaire survey (Table 1) was conducted by email for 16 cases who gave their consent. We established the 3-D headache diagnostic criteria in order to detect specific headache symptoms that are unique in that they are associated with watching 3-D videos. The diagnostic criteria are as follows for a definite 3-D headache: A) Provoked after watching 3-D videos, but was never provoked by 2-D videos, B) Never experienced previously, C) Unclassifiable by the International Classification of Headache Disorders-2nd Edition (ICHD-II) (4). The criteria for a possible 3-D headache were that A) and B) the same as above, C) Classified as a “probable” subtype by the ICHD-II. The headaches were classified according to the 3-D headaches diagnostic criteria.

Results

We received answers from 16 cases (17.4% response rate), including 5 males and 11 females with an average age of 35.8 years (Table 2). The ages of 2 cases were unknown. Case Nos. 2, 4, 13, 14, and 16 had an entirely new type of headache after watching 3-D videos. These headaches did not occur after watching 2-D videos, and the cases had never experienced them before. In addition, these were unclassifiable by the ICHD-II. Therefore, we diagnosed these headaches as definite 3-D headaches. The common characteristics of 5 of the 3-D headaches were that they were bilateral and non-pulsating. In 4 cases, the time from the beginning of the 3-D video to headache expression was within 2 hours, and the duration of headache was from 10 minutes to 24 hours. The intensity of headache was as follows; severe in 2 cases, moderate in 2 cases, and mild is one case. Three of the 4 cases with moderate to severe headache had nausea. In 4 of 5 3-D headache cases, the symptoms were not aggravated by routine physical activity.

Another 6 cases (Nos. 1, 6, 7, 8, 9, 15) also had their headaches for the first time after watching 3-D videos. Although these headaches did not occur after watching 2-D videos, and they had never been experienced them previously, these were classified in a “probable” subclass by the ICHD-II. Therefore, we diagnosed these headaches as “Possible 3-D headaches”.

The remaining 5 cases (Nos. 3, 5, 10, 11, 12) had a past history of headaches. Their headaches after watching 3-D videos were the same type of headache as they had experienced before. The headaches of these cases were considered to be attacks of the same primary headaches as they had experienced previously.

In 13 cases, the headache was provoked after watching 3-D movies, in 2 cases after playing 3-D games, and in 1 case after watching 3-D TV. The 2 cases with headaches after 3-D games did not wear 3-D glasses, while the other 14 cases wore 3-D glasses.

According to the characteristics of the present 3-D technology, the burden to the brain may be different in individu-
Table 2. The Clinical Characteristics of the 16 Subjects

<table>
<thead>
<tr>
<th>Case</th>
<th>Onset</th>
<th>Duration</th>
<th>Aura</th>
<th>Characteristics</th>
<th>Location</th>
<th>Quality</th>
<th>Intensity</th>
<th>Influence of physical activity</th>
<th>Accessory symptom</th>
<th>Past history of headache</th>
<th>Headache with 2D video</th>
<th>Comorbidity</th>
<th>Family history of headache</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.M</td>
<td>60m</td>
<td>30m</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Mild</td>
<td>Uncertain</td>
<td>-</td>
<td>Yes</td>
<td>but another type</td>
<td>-</td>
<td>Mood disorders</td>
<td>Mother</td>
<td>2.1 Probable infrequent episodic tension-type headache</td>
</tr>
<tr>
<td>2</td>
<td>25M</td>
<td>2h</td>
<td>60m</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Moderate</td>
<td>No answer</td>
<td>Nausea</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>Undiagnosable by ICHD-I</td>
</tr>
<tr>
<td>3</td>
<td>42F</td>
<td>0m</td>
<td>6h</td>
<td>Unilateral</td>
<td>Pulsating</td>
<td>Mild</td>
<td>Aggravation</td>
<td>Nausea</td>
<td>Yes</td>
<td>and same type</td>
<td>-</td>
<td>-</td>
<td>Mother Grandmother</td>
<td>1.1 Migraine without aura</td>
</tr>
<tr>
<td>4</td>
<td>46F</td>
<td>0m</td>
<td>10m</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Moderate</td>
<td>No aggravation</td>
<td>Nausea</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>Undiagnosable by ICHD-I</td>
</tr>
<tr>
<td>5</td>
<td>44F</td>
<td>60m</td>
<td>3h</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Mild</td>
<td>No aggravation</td>
<td>-</td>
<td>Yes</td>
<td>and same type</td>
<td>-</td>
<td>-</td>
<td></td>
<td>2.1 Tension-type headache</td>
</tr>
<tr>
<td>6</td>
<td>43F</td>
<td>60m</td>
<td>70m</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Mild</td>
<td>No aggravation</td>
<td>-</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>2.1 Probable infrequent episodic tension-type headache</td>
</tr>
<tr>
<td>7</td>
<td>20F</td>
<td>2h</td>
<td>24h</td>
<td>No answer</td>
<td>Non-pulsating</td>
<td>Moderate</td>
<td>Aggravation</td>
<td>Nausea, photophobia</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Sister</td>
<td>1.1 Probable migraine without aura</td>
</tr>
<tr>
<td>8</td>
<td>31M</td>
<td>2h</td>
<td>8h</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Moderate</td>
<td>No aggravation</td>
<td>-</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>2.1 Probable infrequent episodic tension-type headache</td>
</tr>
<tr>
<td>9</td>
<td>34M</td>
<td>10m</td>
<td>2h</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Mild</td>
<td>No aggravation</td>
<td>-</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>2.1 Probable infrequent episodic tension-type headache</td>
</tr>
<tr>
<td>10</td>
<td>45F</td>
<td>30m</td>
<td>3h</td>
<td>Unilateral</td>
<td>Non-pulsating</td>
<td>Moderate</td>
<td>No aggravation</td>
<td>Nausea, photophobia</td>
<td>Yes</td>
<td>and same type</td>
<td>-</td>
<td>-</td>
<td>Mother</td>
<td>1.2.1 Typical aura with migraine headache (Although duration is short)</td>
</tr>
<tr>
<td>11</td>
<td>46M</td>
<td>2h</td>
<td>24h</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Pulsating</td>
<td>Severe</td>
<td>Aggravation</td>
<td>Nausea, vomiting, photophobia, phonophobia, sensitivity to smell</td>
<td>Yes</td>
<td>and same type</td>
<td>-</td>
<td>Psychosomatic disease (unknown in detail)</td>
<td>1.1 Migraine without aura</td>
</tr>
<tr>
<td>12</td>
<td>20F</td>
<td>2h</td>
<td>12h</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Severe</td>
<td>No aggravation</td>
<td>Nausea</td>
<td>Yes</td>
<td>and same type</td>
<td>-</td>
<td>-</td>
<td></td>
<td>1.1 Migraine without aura (Although no aggravation by physical activity)</td>
</tr>
<tr>
<td>13</td>
<td>35F</td>
<td>30m</td>
<td>24h</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Severe</td>
<td>No aggravation</td>
<td>Nausea</td>
<td>Yes</td>
<td>but another type</td>
<td>-</td>
<td>-</td>
<td></td>
<td>Undiagnosable by ICHD-I</td>
</tr>
<tr>
<td>14</td>
<td>29F</td>
<td>After a little while</td>
<td>During 3D glasses use</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Severe</td>
<td>No aggravation</td>
<td>-</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>Undiagnosable by ICHD-I</td>
</tr>
<tr>
<td>15</td>
<td>JF</td>
<td>Next day</td>
<td>All day</td>
<td>Unilateral</td>
<td>Non-pulsating</td>
<td>Moderate</td>
<td>No aggravation</td>
<td>-</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Sister</td>
<td>2.1 Probable infrequent episodic tension-type headache</td>
</tr>
<tr>
<td>16</td>
<td>39F</td>
<td>10m</td>
<td>-</td>
<td>Bilateral</td>
<td>Non-pulsating</td>
<td>Mild</td>
<td>No aggravation</td>
<td>-</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>Undiagnosable by ICHD-I</td>
</tr>
</tbody>
</table>
als that watch such videos. However, the details of each type of 3-D technology in the 16 investigated cases were not investigated. The duration of headache in all cases ranged from 10 minutes to 24 hours. The headache began immediately after the beginning of 3-D videos in the rapid cases. In the delayed cases, the headache began the next day. In all cases, the headache had disappeared when the survey was conducted. There were no cases with a past history of epilepsy. Neither convulsions nor a loss of consciousness occurred when the headache was provoked.

Discussion

In the present study, we considered 5 cases to have definite 3-D headaches and 6 cases to have possible 3-D headaches. The pathophysiological mechanism underlying 3-D headache has not been reported. Visually-induced motion sickness (VIMS) is reported to be provoked by a condition of sensory rearrangement, in which the motion signals transmitted by the eyes, the vestibular system and the non-vestibular proprioceptors are at variance with one another as expected on the basis of previous transactions (sensory rearrangement theory) (5, 6). This variance of sensation may be associated with the onset of the 3-D headache. Furthermore it has been reported that asthenopia seems to be caused more easily by 3-D vision. Convergence is dominant, and accommodation represents unusual responses when watching 3-D videos, whereas convergence and accommodation operate together under habitual seeing conditions (7). This imbalance of convergence and accommodation may also be associated with the onset of the 3-D headache.

The incidence of 3-D headaches is likely to increase in the future with the spread of 3-D images. And the headaches provoked after watching 3-D videos include not only the attacks of primary headaches but also headache attacks which are unclassifiable by the ICHD-II. Clarification of the pathophysiological mechanism(s), risk factors, and the prophylaxis is an urgent theme that should be examined through the accumulation of cases.

The authors state that they have no Conflict of Interest (COI).

References